Claims

1. An actuator including:
an electric motor having a motor output;
an orbital transmission having:
(a) an eccentric;
(b) a first orbit gear mounted on the eccentric;
(c) a second orbit gear mounted for rotation on the eccentric and fixed to the first orbit gear;
(d) a first outer gear for meshing with the first orbit gear; and
(e) a second outer gear for meshing with the second orbit gear;
one of the eccentric and first outer gear forming an input to the orbital transmission, and one of the second outer gear and eccentric respectively, forming an output from the orbital transmission; and
an output member coupled to the output of the orbital transmission for applying a load.

2. The actuator of claim 1 wherein the eccentric forms the input to the orbital transmission and the second outer gear forms the output from the orbital transmission.

3. The actuator of claim 1 wherein the output member comprises a kidney pulley coupled to the output of the orbital transmission, the kidney pulley receiving a cable so that upon rotation of the kidney pulley in one direction, a load is applied to the cable, and upon rotation of the kidney pulley in the opposite direction, the load is released from the cable.

4. The actuator of claim 1 wherein the first outer gear is arranged in a gear housing, the housing receiving an input shaft which couples with the eccentric and the input shaft mounting the spur gear so that upon rotation

of the spur gear, the input shaft and the eccentric are rotated.

5. The actuator of claim 4 wherein the housing and first input gear are fixed stationary relative to the input shaft and the eccentric and provide a control gear so that when the eccentric is rotated, the first orbit gear is caused to execute an orbit, which in turn causes the second orbit gear to execute an orbit, and the meshing of the second orbit gear with the second output gear, rotates the second output gear, to in turn rotate the kidney pulley.

6. The actuator of claim 5 wherein the second output gear carries at least one sensor for sensing rotary movement of the second output gear, and therefore rotary movement of the kidney pulley.

7. An actuator including:

an electric motor having a motor output;

an orbital transmission having:

(a) an eccentric;

(b) a first orbit gear mounted on the eccentric;

(c) a second orbit gear mounted for rotation on the eccentric and fixed to the first orbit gear;

(d) a first outer gear for meshing with the first orbit gear; and

(e) a second outer gear for meshing with the second orbit gear;

one of the eccentric and first outer gear forming an input to the orbital transmission, and one of the second outer gear and eccentric respectively, forming an output from the orbital transmission;

an output member coupled to the output of the orbital transmission for applying a load; and

a spur gear arrangement between the motor output

and the input of the orbital transmission, and including a spur gear coupled to the input of the orbital transmission, and a pinion gear system meshing with the spur gear and driven by the motor output of the electric motor.

8. The actuator of claim 7 wherein the actuator includes a control section including current limiting means for limiting the current supplied to the motor when the electric motor is to be rotated in the direction to cause the actuator to apply the load, and for supplying a higher current when the electric motor is to be rotated in the second direction to cause the actuator to remove the load.

9. The actuator of claim 7 wherein the eccentric forms the input to the orbital transmission and the second outer gear forms the output from the orbital transmission.

10. The actuator of claim 7 wherein the pinion gear system comprises a first pinion mounted on the motor output, a second pinion in mesh with the first pinion, and the second pinion meshing with the spur gear.

11. The actuator of claim 7 wherein the spur gear arrangement comprises a spur gear having internal teeth and a pinion mounted on the motor output and meshing with the internal teeth of the spur gear.

12. The actuator of claim 11 wherein a single pinion could be mounted on the motor output and mesh with the spur gear.

13. The actuator of claim 7 wherein the output member comprises a kidney pulley coupled to the output of the orbital transmission, the kidney pulley receiving a cable so that upon rotation of the kidney pulley in one

direction, a load is applied to the cable, and upon rotation of the kidney pulley in the opposite direction, the load is released from the cable.

14. The actuator of claim 7 wherein the first outer gear is arranged in a gear housing, the housing receiving an input shaft which couples with the eccentric and the input shaft mounting the spur gear so that upon rotation of the spur gear, the input shaft and the eccentric are rotated.

15. The actuator of claim 14 wherein the housing and first input gear are fixed stationary relative to the input shaft and the eccentric and provide a control gear so that when the eccentric is rotated, the first orbit gear is caused to execute an orbit, which in turn causes the second orbit gear to execute an orbit, and the meshing of the second orbit gear with the second output gear, rotates the second output gear, to in turn rotate the kidney pulley.

16. The actuator of claim 15 wherein the second output gear carries at least one sensor for sensing rotary movement of the second output gear, and therefore rotary movement of the kidney pulley.

17. The actuator of claim 7 wherein the motor and the orbital gear box are arranged in side by side relationship within a casing.

18. A brake applicator for a vehicle, including:

a brake system for applying the brakes of a vehicle;

a cable connected to the brake system; and

a brake actuator engaging the cable for drawing in the cable to apply the brakes or feeding out the cable to release the brakes, the brake applicator having:

(a) an electric motor having a motor output;

(b) an orbital transmission having an input coupled to the motor so that the input can be driven by the motor;

(c) an output from which output rotary power is supplied; and

(d) an output pulley engaging the cable and connected to the output so that when the output rotates in one direction, the cable is drawn in to apply the brakes, and when rotated in the opposite direction, is paid out to release the brakes.

19. The brake actuator of claim 18 wherein the orbital transmission comprises:

(a) an eccentric;

(b) a first orbit gear mounted on the eccentric;

(c) a second orbit gear mounted for rotation on the eccentric and fixed to the first orbit gear;

(d) a first outer gear for meshing with the first orbit gear; and

(e) a second outer gear for meshing with the second orbit gear;

one of the eccentric and first outer gear forming an input to the orbital transmission, and one of the second outer gear and eccentric respectively, forming an output from the orbital transmission; and

an output member coupled to the output of the orbital transmission for applying a load.

20. The brake actuator of claim 18 wherein the brake actuator further includes a spur gear arrangement between the motor output and the input of the orbital transmission, and including a spur gear coupled to the input of the orbital transmission, and a pinion gear system meshing with the spur gear and driven by the motor

output of the electric motor.

21. The brake actuator of claim 19 wherein the eccentric forms the input to the orbital transmission and the second outer gear forms the output from the orbital transmission.

22. The brake actuator of claim 20 wherein the pinion gear system comprises a first pinion mounted on the motor output, a second pinion in mesh with the first pinion, and the second pinion meshing with the spur gear.

23. The brake actuator of claim 20 wherein the spur gear arrangement comprises a spur gear having internal teeth and a pinion mounted on the motor output and meshing with the internal teeth of the spur gear.

24. The brake actuator of claim 23 wherein a single pinion could be mounted on the motor output and mesh with the spur gear.

25. The brake actuator of claim 19 wherein the output member comprises a kidney pulley coupled to the output of the orbital transmission, the kidney pulley receiving a cable so that upon rotation of the kidney pulley in one direction, a load is applied to the cable, and upon rotation of the kidney pulley in the opposite direction, the load is released from the cable.

26. The brake actuator of claim 19 wherein the first outer gear is arranged in a gear housing, the housing receiving an input shaft which couples with the eccentric and the input shaft mounting the spur gear so that upon rotation of the spur gear, the input shaft and the eccentric are rotated.

27. The brake actuator of claim 26 wherein the

housing and first input gear are fixed stationary relative to the input shaft and the eccentric and provide a control gear so that when the eccentric is rotated, the first orbit gear is caused to execute an orbit, which in turn causes the second orbit gear to execute an orbit, and the meshing of the second orbit gear with the second output gear, rotates the second output gear, to in turn rotate the kidney pulley.

28. The brake actuator of claim 27 wherein the second output gear carries at least one sensor for sensing rotary movement of the second output gear, and therefore rotary movement of the kidney pulley.